Cold fusion - The Salvage from the Energy Crisis?

By fusion two or more atomic nuclei, protons or neutrons fuse together to form a new atomic nucleus. The new nucleus is held together by the strong forces between the heavy particles, protons and neutrons. These forces are so strong that they win over the repulsing electromagnetic forces between protons.
In 1989 the chemistry professors Stanley Pons and Martin Fleishman reported that they had achieved cold fusion in a palladium anode emerged in a solution of sodium deuteroxide in heavy water D2O. Due to a bad exactness of their report, only few other scientists managed to replicate their findings in the first place. The findings were then dismissed as due to misunderstandings and bad scientific practice, and the matter of cold fusion has since been regarded as a taboo area.

However, some scientists did manage to replicate the findings, and quietly an enormous amount of positive research findings based on experiments of a lot better quality have been published. The phenomenon is again becoming accepted as a legitimate field of research by steadily more scientists..

However, what is really going on is not well understood. Heat production, detected radiation and detected fusion products suggest that some kind of nuclear reaction or fusion takes place, but the reactions do not show the amount of radiation and the ratios of products that known hot fusion reactions do. Therefore other names of the phenomenon are often used, like Low Energy Nuclear Reactions or (LENR) or Chemically Assisted Nuclear Reactions (CANR).

WHAT IS FUSION.

By fusion two or more atomic nuclei, protons or neutrons fuse together to form a new atomic nucleus. The new nucleus is held together by the strong forces between the heavy particles, protons and neutrons. These forces are so strong that they win over the repulsing electromagnetic forces between protons.

However, the strong forces only work at a short distance. Therefore the nucleons (neutrons and protons) must be brought very close together. This is difficult because of the repulsing electromagnetic forces between the protons. In traditional fusion this is achieved by very high pressure and temperature in the fusing material.

The mass of a helium nucleus (consisting of two protons and two neutrons) and other light nuclei are less than the mass of the same number of free protons, neutrons or deuterium nuclei. A deuterium nucleus consists of one proton and one neutron. Heavy water contains deuterium instead of ordinary hydrogen and is therefore designed D2O. When fusion takes place, this mass difference cannot be lost. It is converted to kinetic energy and gamma radiation. Therefore fusion of protons, neutrons or kernels of the very lightest elements into heavier elements is a very potent energy source.

One has not been able to make a controlled fusion by high temperature and pressure that yields more energy than the input energy yet. The only practical way one has managed to exploit the energy from warm fusion is the hydrogen bomb..

THE PROCESS BEHIND COLD FUSION.

There is no fully developed model for cold fusion yet. The hypothesis behind the phenomenon is however very simple: All particles behave according to quantum mechanical laws. These laws say that the coordinates and energy state of a particle at one point in time determine the probability of finding a particle at a place with some given coordinates at another point of time, but the exact place cannot be predicted. Actually, a particle can be found anywhere at that other time point, but all places do not have the same probability. Some places are very probable, and others are very improbable. Because of this, even a particle that is not in any net motion nevertheless will shift place randomly to some extend, usually very little, but sometimes more.

By bringing particles and nuclei very near each other by using some force, this will happen: The quantum mechanical behaviour will as always make the particles shift their position more or less all the time, and sometimes they get near enough to let the strong nuclear forces to take action and make them fuse.

According to standard understanding of the standard theory, this cannot happen in such a degree to be detected. Still it does. Either the standard theory is not complete, or one has not learned to use the theory in a right fashion. The mathematical apparatus of the theory is so complicated, that it is impossible to predict what can happen and what cannot happen with a short glance at the equations.

Cold fusion differs in many aspects from warm fusion. It is difficult to produce warm fusion of other things than one deuterium and one tritium kernel. By cold fusion, two deuterium kernels easily fuse to helium, and even fusion involving hydrogen kernels (free protons) have been reported.

Output of neutrons (n), tritium (T), protons (p) and gamma radiation has been reported by cold fusion, but not in the amount predicted by standard understanding. These are the reactions that standard understanding predicts when two deuterium kernels fuse: D + D --> ^{3}He + n, D + D --> T + p, D + D --> ^{4}He + gamma photon.

THE ORIGINAL PONS-FLEISCHMAN SYSTEM.

The original experiment exerted by Pons and Fleischmann consisted of these elements: A palladium cathode, a nickel anode and a solution of sodium deuteride NaOD (20%) in heavy water D_2O. Sodium deuteride is sodium hydroxide with heavy hydrogen (deuterium) in the OH^- ion, and therefore designed as OD^-.

When electricity was applied to this electrolytic system, deuterium atoms were produced at the cathode, and oxygen at the anode. The deuterium atoms went into the palladium crystal lattice in great extend before combining to D_2.

Excess heat was then produced in the electrolytic cell, apart from the electrolytic heat. Helium, tritium and neutrons were also produced, but the latter two products not in the amounts that would have been produced in a hot fusion. Therefore the fusion reactions in the system are different form those in hot fusion, and probably more complicated.

Only few scientists managed to reproduce the results in the first place, because of bad documentation from the originators. However, some of them succeeded, and gradually the conditions for a satisfactory fusion have been established. The best fusion occurs when the palladium is somewhat over-saturated, that is when there are nearly as many atoms of deuterium as those of palladium in the crystal.

The saturation is controlled by the voltage applied, and by using palladium structures composed of very thin layers or very small grains. The electrolysis in itself is only a means to put deuterium into the palladium crystal matrix.

THERE ARE MANY WAYS OF OBTAINING COLD FUSION

As seen, cold fusion processes can be initiated by packing many deuterium kernels into inter-atomic rooms in a crystal lattice. A critical density for starting a fusion process seems to be the same density as in liquid pure deuterium. Since there is no fusion process in liquid deuterium, the crystal lattice probably packs the deuterium kernels together in tight sub-microscopic groups with much greater density than the average density in the lattice as a whole, and thus allowing quantum mechanical tunnelling between the kernels in the groups.

There are other electrolytic solutions than that used by Fleischman and Pons that can be used in combination with palladium electrodes to obtain cold fusion. By electrolysing a solution of KCL/LiCL/Lid using a palladium anode, signs pointing at cold fusion have been reported, but many attempts of reproducing the results have failed.

Any force that is able to push enough D^+ ions into the right types of metal crystal lattice, can be used to deliver cold fusion. For example can signs of fusion be produced by bombarding the right kind of metallic lattice with accelerated D^+ - ions.

By an electrical discharge between palladium electrodes in a deuterium gas, signs of fusion have been seen. By such a discharge, plasma consisting of D+ ions and electrons will be formed between the electrodes. The D+ ions will be attracted to the surface of the negative electrode, and a high density of D+ will occur at this surface. Since also these D+ -ions will have a high thermic energy; many of them will be thrown very near each other. Quantum-mechanical tunnelling can then do the rest of the approaching process, so that fusion can take place.

Also high pressure can be used to push enough deuterium into a metal lattice to give fusion. For example, by having finely divided palladium grains in a pressurized deuterium gas, signs of fusion have been produced, and replicated by other scientists.

Also by reactions where nickel metal and H2 combine, signs of fusion have been detected. Even though H2 and not D2 has been used, the reaction has still been reported to take place. This points to a very different reaction mechanism than that of warm fusion. Some scientists speculate that hydrogen atoms can exist in quantum states where the electron and proton are so near each other that the atom reacts like a neutron.

MICROSCOPIC WARM FUSION IN OSCILLATING SONOLUMINATING GAS BUBBLES

By bombarding gas bubbles in a liquid by ultrasonic waves, the bubbles can be brought into an extreme oscillation of expansions and collapses synchronized with the sound frequency.

Such oscillating bobbles can send out light by certain frequencies of expansions and collapses, and by the right compositions of the gas. By each collapse, the spot temperature in the bobble can reach as much as 10 mill degrees, even though the average temperature in the total blending is near room temperature.

When deuterium is present in the oscillating bobbles, fusion has been observed. This fusion is strictly not cold fusion, but resembles hot fusion, and the process sends out neutrons, gamma-rays and tritium atoms as predicted by standard understanding.

The process has not been reported to produce more energy that that put in, but is confirmed by independent investigators.

COMMERCIAL POTENTIAL

Cold fusion in crystal lattices has been shown to produce more energy than that put in. Experimental 1 MW or more experimental reactors has been set up and demonstrated.

Commercial reactors are by now being developed, but no one has yet been able to show a reactor with stabile enough operation to be sold on the market. Commercial household heaters seem to be the first type of reactors these companies try to develop. The hope of the companies is that these will make a way for greater reactors and uses in the market.

By now it is not easy to see how successful cold fusion will be in the energy market. Cold fusion may make a revolution that gives the world cheap clean energy in enormous quantities, but no one knows yet.

-- Knut Holt is an internet marketer and consultant focusing at technical and scientific items. To find: Remote controle helicopters, airplanes, cars and boats. Airsoft guns of all models. Chemistry sets. Electronic sets, transmitters and electronic components. Professional microscopes and binoculars. Night vision instruments: ---

http://www.mydeltapi.com

For cosmetic products, supplements to help against common diseases and anti-aging products: ---

http://www.panteraconsulting.com
